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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/577,309	01/19/2007	Tatsuo Esaki	1272-0124PUS1	5180

2292 7590 11/25/2009
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EXAMINER	
LANGMAN, JONATHAN C	

ART UNIT	PAPER NUMBER
1794	

NOTIFICATION DATE	DELIVERY MODE
11/25/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/577,309	ESAKI ET AL.	
	Examiner	Art Unit	
	JONATHAN C. LANGMAN	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 May 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4* is/are pending in the application.

4a) Of the above claim(s) *3 and 4* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 2* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/20/2009*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 11, 2009 has been entered.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1 and 2 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the instantly claimed warp, sheet resistivity, and shear strength, does not reasonably provide enablement for the instantly claimed warp, sheet resistivity, and shear strength when the structure is the same as instantly claimed. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to provide the invention commensurate in scope with these claims.

The instant structure of the claims is two AlN sintered plates joined by a metal layer and comprising the specific material properties. However within the specification (pg 12, lines 21-25) and in all of the Examples, at least one of the

AlN bodies must be provided with a recess, and furthermore, there must be an adhesive layer formed between the metal layer and an AlN body.

All of the examples that encompass the instantly claimed material properties (i.e. warp, sheet resistivity, and shear strength), necessarily provides a recess and an adhesive layer. The applicant does not provide any enablement for the instantly claimed structure of just two AlN sintered plates joined by a metal layer comprising the instantly claimed material properties (i.e. warp, sheet resistivity, and shear strength). The examiners position is further supported in the specification where the applicant teaches that the adhesive layer is necessary to suppress warping (pg 11, lines 5-10; and pg 15, line 30-pg 16, lines 32; especially pg. 16, lines 25-32).

Accordingly, it is the Examiner's position that the present claims are broader than the enabling disclosure.

Claims 1 and 2 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The adhesive layer, particle size, and recessed portion formed in the surface of the AlN sintered plate are all structural properties that are deemed critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). The applicant states in the response dated May 11, 2009, on page 4, in the first full paragraph:

> The above AlN junction body (one with all the specific material properties instantly claimed i.e. warp, resistance, and shear strength) can be produced by charging an electrically conducting paste containing fine

> tungsten or molybdenum powder (having an **average particle size of not larger than 3.5 microns**) in a **recessed portion** formed in the surface of the AlN sintered plate. An **adhesive layer** is formed by applying an adhesive paste containing AlN onto the surface of the AlN sintered plate followed by dewaxing. Another AlN plate is then brought into pressed contact with the surface on which the adhesive layer has been formed. Sintering is then effected in this state in two steps at a temperature of 1600-1700 °C (primary sintering) and at a temperature of 1800-1900°C (secondary sintering). **When the above method is employed the AlN junction body having the above mentioned properties is obtained. Other methods, such as those of the prior art, do not result in the present AlN junction body.**

The emphasized portions, i.e. average particle size, recessed portion, and adhesive layer are all features that are considered essential by the applicant however are not reflected in the claims which are rejected.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. (US 2003/0108729).

Yamamoto et al. teach a joined aluminum nitride body. The nitride body comprises two green AlN compacts ([0138] and [0141]) joined by a whole surface covered by an electrically conductive paste layer formed of 100 parts tungsten

and 5 parts aluminum nitride ([0139]). The thickness of the tungsten electrically conductive layer is 20 microns thereby falling within the instantly claimed range of 15-100 microns. Yamamoto then tested the material for warp, resistivity, and shear strength the results are seen in Table 3. The adhesive strength as seen for all examples is greater than 4 kg/mm^2 (table 3 and [0038]). The AlN body is 65x65mm and experiences a warpage of less than 50 microns for most examples. A warpage of less than 50 microns over a 65mm length correlates to a warpage of 76.9 microns/100 mm, which falls within the applicants instantly claimed range of less than 100 microns/100mm. The electrical resistance of the vias are measured and taught to be less than $1x10^{-1}$ ohms/cm (Table 3, last column). The resistivity of the electrically conductive layer expected to be very similar to that of the vias as they are made of similar paste materials (100 parts by weight tungsten and 5 parts by weight aluminum nitride). The sheet resistivity is expected to be similar to the measured electrical resistivity of Yamamoto.

Furthermore, the structure of Yamamoto has a similar structure and similar materials to that which are instantly claimed, and therefore it is inherent that it shares the same properties as instantly claimed. It has been held that where the claimed and prior art products are identical or substantially identical in structure or are produced by identical or a substantially identical processes, a prima facie case of either anticipation or obviousness will be considered to have been established over functional limitations that stem from the claimed structure. *In re Best*, 195 USPQ 430, 433 (CCPA 1977), *In re Spada,* 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). The ***prima facie*** case can be rebutted by evidence

showing that the prior art products do not necessarily posses the characteristics of the claimed products. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Therefore it is inherent that the structure of Yamamoto possesses the same properties (i.e. sheet resistance) as instantly claimed, because Yamamoto teaches the same materials, as well as substantially identical structures and processes for achieving the structure instantly claimed.

Even though the structure of Yamamoto teaches cofiring green AIN bodies, and not firing sintered AIN compacts, these are product by process limitations which are given little to no patentable weight. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.", (In re Thorpe, 227 USPQ 964,966). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product (In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983), MPEP 2113). The resultant structure of Yamamoto will comprise two sintered AIN ceramic bodies joined by a sintered metal layer, and this structure, for reasons given above, possesses the same material properties as instantly claimed. Therefore the product by process

limitations of joining two sintered plates, versus the joining of green bodies taught by Yamamoto, are given little to no patentable weight.

Regarding claim 2, in the examples Yamamoto teaches that the electrically conductive layer covers the entire surface of the AlN body before joining, however Yamamoto teaches that it is preferred that the electrically conductive layer covers between 30 and 100% of the structure thereby completely overlapping the instantly claimed range ([0031]).

Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yushio et al. (US 6,423,400) in view of Yamakawa et al. (US 5,370,907).

Yushio et al. teach a susceptor for semiconductor manufacturing equipment obtained by joining plural aluminum nitride layers, 11, with a high melting point metallic layer, 12, and an adhesive layer, 13 (abstract, and col. 6, lines 1-45). The metallic layer preferably has a thickness of 1-100 microns and preferably made of tungsten or molybdenum (col. 8, lines 18-35), or in a specific example has a thickness of 30 microns (col. 22, lines 35-40). After sintering the

article, material properties were tested. These material properties included shear strength and warp. The warp was measured to be less than 1 micron/1mm (100 microns/100 mm) (see at least col. 23, lines 34-68). The bonding strength, (peeling strength) also known as the shear strength between the metallic layer and the ceramic substrate, which is the same context that the applicant uses, is measured and results are provided in Table 8. Yushio teach a shear strength of up to 3.3 kg/mm^2 and fails to teach a bond strength of greater than 4 kg/mm^2.

Yamakawa et al. teach a high melting temperature metal comprising a mixture of tungsten, molybdenum and glass frits on an aluminum nitride ceramic body, and a method of improving the peel strength (shear strength) (see at least abstract and col. 1, lines 25-65). By mixing tungsten and molybdenum in certain rations, shear strengths of greater than 5 kg/mm^2 are obtainable (col.3, lines 60-63). The applicant is also directed to table 3, comparative examples 1 and 2, which show that tungsten and glass frits (similar to those disclosed by Yoshio) only obtain a shear strength of 3 kg/mm^2, however when small amounts of Mo are added to the Tungsten mixture, higher adhesive strengths are obtained. It would have been obvious to a person having ordinary skill in the art at the time the present invention was made to use the blended metal layers (Mo and W) of Yamakawa as a substitute to the metal layer (W) of Yushio; because Yamakawa et al. teaches a higher bonding strength compared to that of Yushio, which results in a better product with longer life ability due to the resistance to shear apart is obtainable.

Yamakawa is silent to the sheet resistivity of the metal layer. However the applicant's teach in the instant specification that the sheet resistivity is a function of material and layer thickness (pg. 10, lines 16-30). It is noted that Yamakawa teaches similar materials and the same obvious overlapping layer thickness ranges taught by Yushio. Therefore it is inherent that the prior art conductive layers will possess the same electrical sheet resistance instantly claimed. It has been held that where the claimed and prior art products are identical or substantially identical in structure or are produced by identical or a substantially identical processes, a prima facie case of either anticipation or obviousness will be considered to have been established over functional limitations that stem from the claimed structure. *In re Best*, 195 USPQ 430, 433 (CCPA 1977), *In re Spada,* 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). The ***prima facie*** case can be rebutted by evidence showing that the prior art products do not necessarily posses the characteristics of the claimed products. *In re Best*, 195 USPQ 430, 433 (CCPA 1977). Since Yamakawa teaches an electrical layer comprising tungsten and molybdenum similar to those materials instantly claimed, and further when combined into the obvious structure of Yushio which teaches overlapping ranges of thicknesses similar to those instantly claimed, it is the examiners position that the prior art electrically conductive layers will inherently possess the same electrical sheet resistance. A material and its properties are inseparable.

Regarding claim 2, Yushio et al. do not specifically teach a conductor paste covering 50-90% however, as seen in Figure 3, the conductor paste covers

a surface of the ceramic substrate in a portion falling within the instantly claimed ranges of 50-90%. As seen in the figure the conductive layer covers more than half of the ceramic substrate, and does not cover the entire substrate so less than 100%. Therefore it is said that the surface area of metal layer falls within the applicants claimed surface area.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yushio et al. (US 6,423,400) in view of Yamakawa et al. (US 5,370,907) as applied to claims 1 and 2 above, further in view of Ito et al. (PCT/JP02/08223, wherein US 2004/0071945 is used as an English Translation) or Yamamoto et al. (US 2003/0108729).

Again as stated above, Yamakawa is silent to the sheet resistance of the electrically conductive layer. For reasons stated above, it is inherent that the electrically conductive layer of Yamakawa comprises the instantly claimed sheet resistance. For completeness of the record and to further support the Examiners position, the Examiner relies on other art to teach those material properties not claimed (i.e. particle size) but that may influence the sheet resistance.

The applicants teach that the sheet resistivity can be reduced by decreasing the particle size of the tungsten and molybdenum materials forming the paste. These particle sizes are taught by the applicant's to be preferably 1-3 microns (page 14, lines 11-27).

Ito et al. teaches that when printing pastes of metal material, specifically, molybdenum and tungsten particles, the average particle size is preferably 0.1-5 microns, in order to ease in the deposition of the conductor containing paste (Ito et al., [0126]-[0128]).

Yamamoto et al. teach that electrically conductive layers comprising tungsten, formed on AlN layers, should preferably have particle sizes of 1.0-3.0 microns to produce a dense electrically conductive layer and to reduce the occurrence of warpage of the aluminum nitride substrate ([0056]).

Therefore it would have been obvious to a person having ordinary skill in the art at the time the present invention was made to use Mo and W particles ranging between 0.1 and 5 microns in size, more specifically 1.0-3.0 microns for the deposition of a refractory metal conductive paste on ceramic substrates because these particle size ranges are taught by Ito et al. to result in easier deposition, and further because these particle sizes are taught to form a dense electrically conductive layer that reduces warpage of the sintered body.

Furthermore it is noted that Yushio and Yamakawa both teach screen printing the conductor paste onto the ceramic substrate (col. 6, lines 55) and (col. 8, lines 48-54), respectively. The screen printed metal paste of Yamakawa et al. utilizing these obvious particle sizes will inherently possess the instantly claimed sheet resistivity, since, Yamakawa et al. teach the same materials and Yushio teach the same thicknesses, and Ito teaches the obvious particle size distribution (See in re best case law applied above)

The applicants teach that by using smaller particle sizes for the conductor material will result in lower sheet resistance but may result in high warp values. These warp values are taught by the applicant in the instant specification to be suppressed by the addition of an adhesive layer (instant specification, pg 16 lines 25-31). In light of the instant specification, since Yushio et al. teaches the same structure of providing an adhesive layer, 13, on top of the metal conductive layer, 12, it is assumed, expected, and inherent that the structure of Yushio will result in the same warp values as instantly claimed.

Regarding claim 2, Yushio et al. do not specifically teach a conductor paste covering 50-90% however, as seen in Figure 3, the conductor paste covers a surface of the ceramic substrate in a portion falling within the instantly claimed ranges of 50-90%. As seen in the figure the conductive layer covers more than half of the ceramic substrate, and does not cover the entire substrate so less than 100%. Therefore it is said that the surface area of metal layer falls within the applicants claimed surface area.

Furthermore, Ito et al. teach similar configurations of the metallic layer on the surface of the ceramic substrate as seen in Figures 6-8. Ito go on to teach that the area where no conductor is formed above the bonding interface is preferably 5% or more ([0021]-[0022]). Thus Ito et al. teach 0-95% conductor surface area on the bonding interface of the substrate. Furthermore Yamamoto et al. teach that electrically conductive layers formed on aluminum nitride bodies, should cover 30-100% of the aluminum nitride body. It would have been obvious to a person having ordinary skill in the art at the time the present invention was

made to use this conductor surface area as taught by Ito or Yamamoto, which includes that presently claimed, on the bonding interface of the ceramic substrate of Yushio et al., in order to provide maximum effective bonding strength.

Response to Arguments

To summarize, the 103a rejection is based on the combination of Yushio with Yamakawa. Yushio teaches a structure of AlN/metal layer/adhesive/AlN with a metal layer of tungsten and low melting glass. This melting layer only possesses a strength of up to 3.3 kg/mm^2. Yamakawa teaches a metal layer in the same art that obtains higher bonding strengths by substituting portions of tungsten with molybdenum. The metal layer of Yamakawa which teaches mixed Mo and W is substituted for the metal layer of Yushio, since Yushio teaches that by mixing Mo and W, higher adhesion strengths are obtained (see comparative examples 1 and 2 of table 3 of Yamakawa).

The applicant repeatedly argues against the metal layer of Yushio, however this layer was substituted for the metal layer of Yamakawa. To advance prosecution, since Yamakawa also teaches the addition of glass into their layers, the applicants arguments will be considered in light of Yamakawa's metal layer with the addition of glass ceramics and not to Yushio's as presented by the applicant.

The applicants argue that the instant claim limitation of "the sheet resistance being not larger than 1 x 10^{-1} ohm/square means that the high melting metal layer is blended without a high electrical resistance component such as low

melting glass" (page 5 of the remarks). The applicants argue that the AlN junction body of Yushio et al '400 (Yamakawa), in which the high melting metal layer is blended with the low melting glass, has a very high sheet resistance that would exceed far beyond the claimed range of not larger than $1x10^{-1}$ ohm/square.

These arguments are merely attorney's assertions and not supported by evidence on the record. However, it is noted that "the arguments of counsel cannot take the place of evidence in the record", *In re Schulze*, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965). It is the examiner's position that the arguments provided by the applicant regarding the addition of low melting glass to the conductor pastes, as described by Yamakawa, must be supported by a declaration or affidavit. As set forth in MPEP 716.02(g), "the reason for requiring evidence in a declaration or affidavit form is to obtain the assurances that any statements or representations made are correct, as provided by 35 U.S.C. 24 and 18 U.S.C. 1001".

When describing the instantly claimed sintered metal layer, the applicant does not use closed end terminology, wherein the layer may have tungsten or molybdenum, but is not limited thereto, and may comprise other constituents. Therefore any teaching such as that of Yamakawa which teaches the addition of glass ceramics, or the newly applied reference of Yamamoto which teaches the addition of AlN into the sintered metal layer are still inclusive of the metal layer instantly claimed.

The applicant has failed to persuasively show through evidence that the 10% addition of low melting glass, or 5% addition of AlN (as newly disclosed by Yamamoto) will result in sheet resistance of a metal layer that falls outside the instantly claimed sheet resistance. The attorney's assertions are not to take place of evidence on the record.

The applicant's arguments to Yamakawa (page 6 of the response, middle of the page) seem to be misplaced. The applicant states that Yamakawa teaches an adhesive layer and does not teach using the addition of low melting point glass to the paste. However, this position is not founded in Yamakawa. Yamakawa does not teach an adhesive layer and Yamakawa teaches the addition of low melting glass to their melting layer. Therefore these arguments are not considered persuasive.

Even furthermore, it was and still is the Examiner's position that decreasing the particle size to 1-3 microns would result in lower sheet resistances. Since the combination of Yamakawa with Ito results in the particle size of Mo and W to be in this taught range, it is again the examiners position that the modified Yamakawa layer will have a sheet resistance as instantly claimed.

The applicant argues that Ito et al are directed to cofiring green AlN ceramics and that by cofiring the green sheets as disclosed by Ito shrinking occurs so that warping cannot be suppressed to the degree recited. These

arguments are not found persuasive. The Examiner was using Ito as a teaching reference for the particle size of W or M when screen printing. While Ito et al. do not disclose all the features of the present claimed invention, Ito et al. is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, *In re Nievelt*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, namely particle size of Mo and W for screen printing and in combination with the primary references, discloses the presently claimed invention.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JONATHAN C. LANGMAN whose telephone number is (571)272-4811. The examiner can normally be reached on Mon-Thurs 8:00 am - 6:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on 571-272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JCL

/Timothy M. Speer/
Primary Examiner, Art Unit 1794